2021 Open Data Workshop
(December 7th)

DCOTSS
NASA Earth Venture Suborbital 3
Dynamics and Chemistry of the Summer Stratosphere

Photochemical Model Output

jval & pss

PI: Ross Salawitch, rsalawit@umd.edu

Data Collection/Creation Process

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Models:

1. Photochemical steady state (PSS) box model we have developed and applied to data collected during numerous prior NASA airborne field campaigns
    - A key component of the PSS model is photolysis frequencies (J values) both:
      a) along the flight track (available, to be discussed today)
      b) "as the sun comes up, and as the sun does down" for each point along the flight track (files are quite large; please contact us if you would like these files to be submitted to the archive)
2. Suite of chemistry-climate models (CCMs) developed by other groups with which we maintain active collaborations, and that share output via archives
3. Multiple linear regression of satellite ozone, constrained by a suite of measurements

J values available for 105 species (some species repeated using various cross sections) as well as other radiative transfer quantities of interest, at 10 sec temporal resolution, ***along flight track*** matched to the time interval of Wofsy merge files and in Gaines/Hipskind format:

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176  1001
Salawitch, Ross
University of Maryland, Collge Park MD: rsalawit@umd.edu
Instantaneous J-values from photolysis code version 16.
DCOTSS 2021
1    1
2021 07 23   2021 11 14
0
Time (GMT, sec) along ER2 flight path
117
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Pressure (mbar)
Solar Zenith Angle (deg)
Reflectivity (fraction)
Cloud Height (mbar)
Total O3 Column (DU)
Overhead O3 Column (DU)
J(O2)          (/sec) JPL 2000 Cross Section
J(O3->O(ALL))  (/sec) JPL 2006 Cross Section
J(O3->O(1D))   (/sec) JPL 2000 Quantum Yield
J(CO2)         (/sec) JPL 2000 Cross Section
J(H2CO->H+HCO) (/sec) JPL 2015 Cross Section & Qyld
J(H2CO->H2+CO) (/sec) JPL 2015 Cross Section & Qyld
J(H2O)         (/sec) JPL 2000 Cross Section
J(H2O)         (/sec) JPL 2011 Cross Section
J(H2O2)        (/sec) JPL 2000 Cross Section, extended to 400 nm by log-linear extrapolation
J(HO2)         (/sec) JPL 2000 Cross Section
J(N2O)         (/sec) JPL 2006 Cross Section
J(NO)          (/sec) JPL 2000 Cross Section
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Mixing ratios of radical and reservoir species of active nitrogen (NO, NO2, NO3, N2O5, HNO2, HNO3, HNO4), hydrogen (OH, HO2, H2O2), chlorine (Cl, ClO, OClO, Cl2, ClNO2, ClNO3, HOCl, HCl) and bromine (Br, BrO, Br2, BrCl, HOBr, HBr, OBrO) will also be computed and archived along the flight track, at 1 min time resolution

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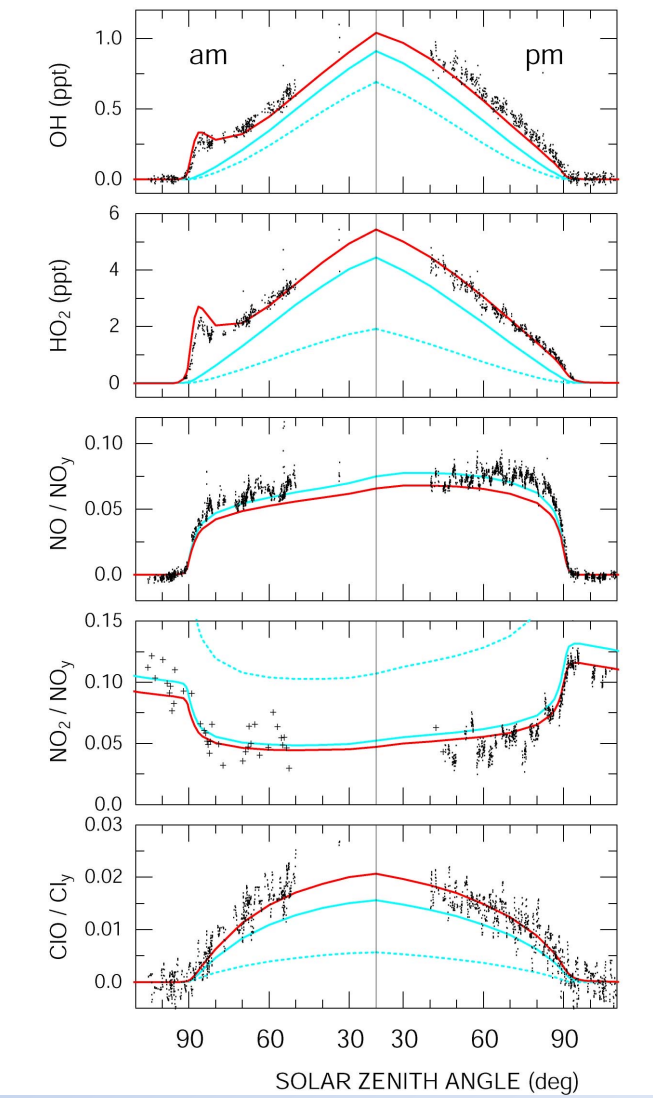

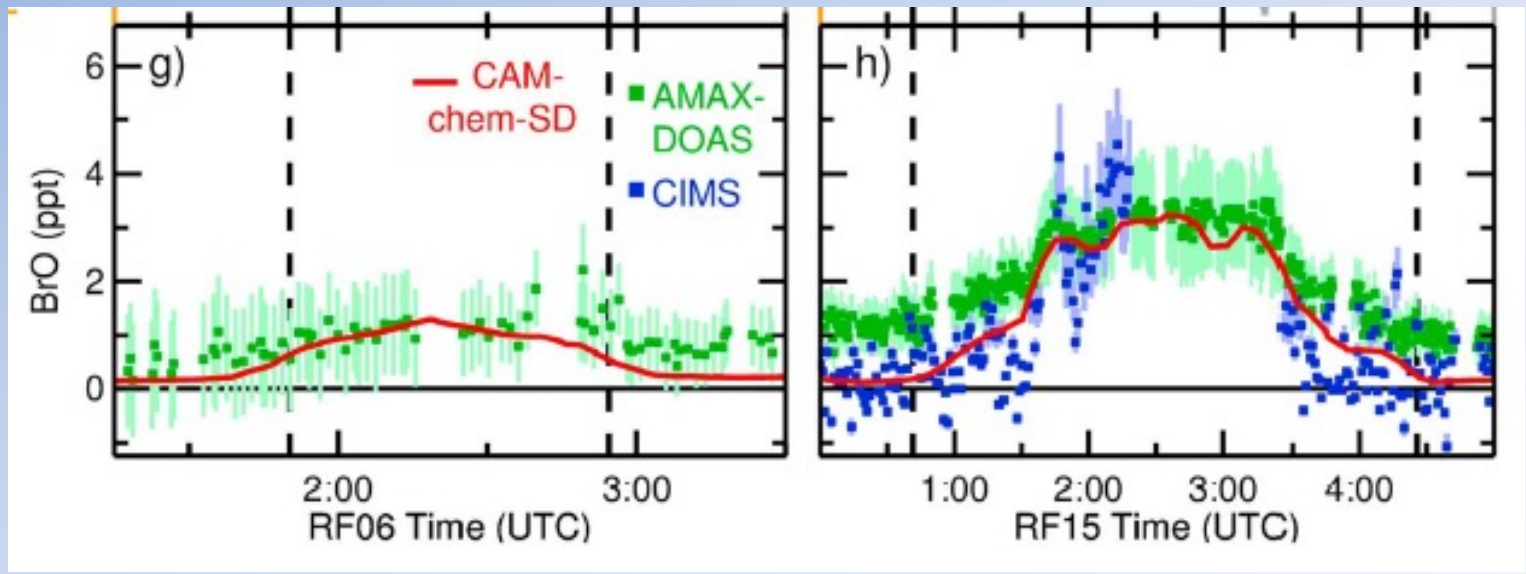

Wales *et al., JGR*, 2018

Salawtich *et al., GRL*, 1994

Mixing ratios of radical and reservoir species of active nitrogen (NO, NO2, NO3, N2O5, HNO2, HNO3, HNO4), hydrogen (OH, HO2, H2O2), chlorine (Cl, ClO, OClO, Cl2, ClNO2, ClNO3, HOCl, HCl) and bromine (Br, BrO, Br2, BrCl, HOBr, HBr, OBrO) will also be computed and archived along the flight track, at 1 min time resolution

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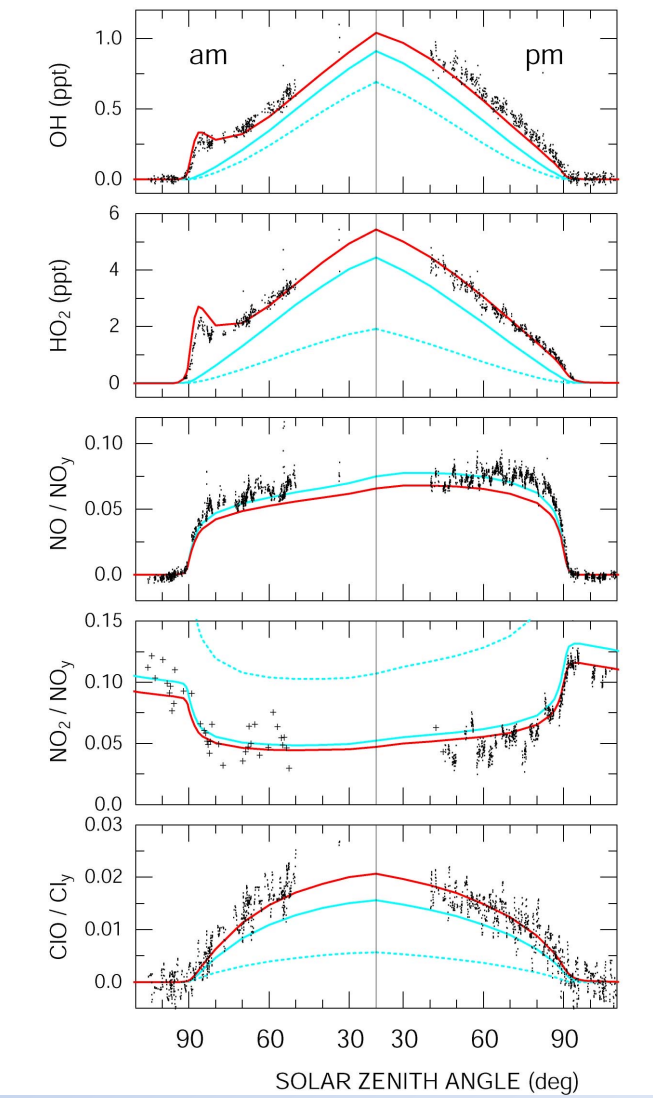
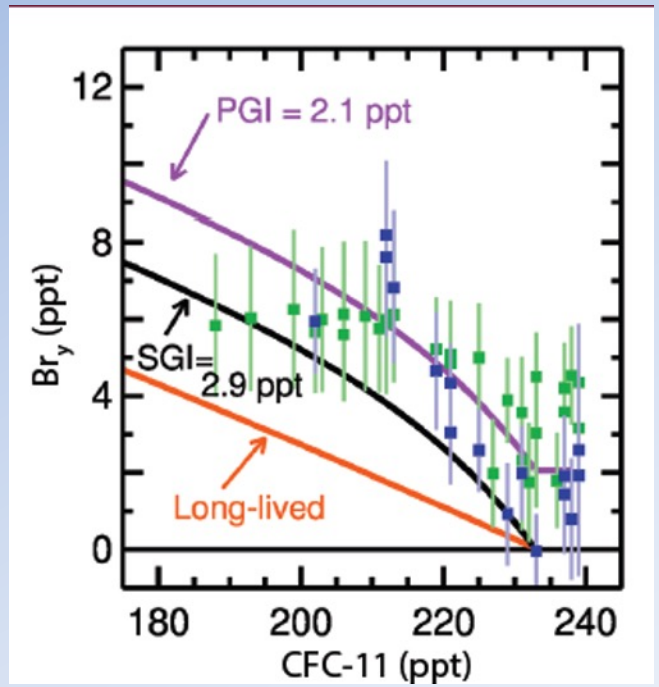


Salawtich *et al., GRL*, 1994



Wales *et al., JGR*, 2018

Data Limitations & Considerations

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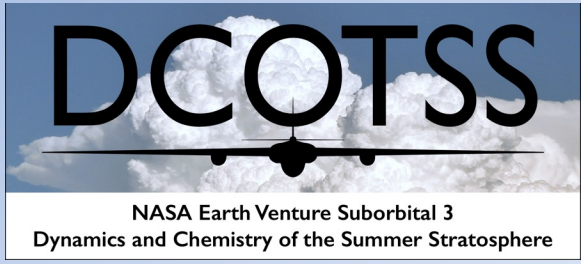
J values available for 105 species (some species repeated using various cross sections) as well as other radiative transfer quantities of interest, at 10 sec temporal resolution, ***along flight track*** matched to the time interval of Wofsy merge files

- Have currently "assimilated" total ozone column from OMI along the flight track into the computation of Jvalues
- Working on the assimilation of total ozone column from TROPOMI (finer spatial resolution than OMI; also OMI has some "gaps" during certain DCOTSS flight dates) as well as reflectivity from TROPOMI into the computation of Jvalues
- Please contact me if you could like to see estimates of photolysis frequencies for other species

Tentative Archival Timeline



J values (photolysis frequency) : end of this year

PSS output: early spring 2022

Upcoming Conference Presentations

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AGU

Salawitch et al., A33D-07, The Impact of Very-Short Lived Chlorine Compounds and GHGs on Trends in Stratospheric Ozone, will not use data from DCOTSS, but will "motivate" our interest in the potential role of anthropogenic, very short lived chlorine species on slowing down the rate of ozone recovery.